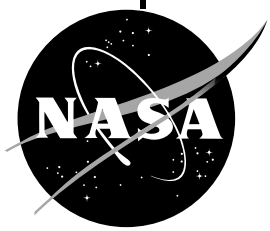
540-036

MISSION OPERATIONS AND DATA SYSTEMS DIRECTORATE

Interface Control Document (ICD) Between the Earth Observing System (EOS) Data and Information System (EOSDIS) Backbone Network (EBnet) and Systems Monitoring and Coordination Center (SMC)

August 1996



National Aeronautics and Space Administration

Goddard Space Flight Center
Greenbelt, Maryland

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August 1996

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540-036

Preface

This document is under the configuration management of the National Aeronautics and Space Administration (NASA) Communications (Nascom) Division Configuration Control Board (CCB).

Proposed changes to this document shall be submitted to the Nascom CCB, along with supportive material justifying the change. Changes to this document shall be made by document change notice (DCN) or by complete revision.

Questions concerning this document and proposed changes shall be addressed to:

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Abstract

This Interface Control Document (ICD) describes interface agreements between the Systems Monitoring and Coordination Center (SMC) and Earth Observing System (EOS) Data and Information System (EOSDIS) Backbone Network (EBnet).

Keywords: *EBnet, ICD, Interface Control Document, SMC*

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DCN Control Sheet

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Section 1. Introduction

1.1 Authority and Responsibility

The Mission Operations and Data Systems Directorate (MO&DSD) has the authority to implement Earth Observing System (EOS) Data and Information System (EOSDIS) Backbone Network (EBnet). This authority was granted to the MO&DSD by the EOS project, under the Office of Mission to Planet Earth (Code Y). The EBnet project is under the National Aeronautics and Space Administration (NASA) Communications (Nascom) Division of the MO&DSD.

1.2 Purpose

The purpose of this document is to provide a detailed definition of the interface(s) between the EBnet and the Systems Monitoring and Coordination Center (SMC).

1.3 Scope

This document defines and specifies the data transport interface(s) (i.e., protocols, standards applied, physical connections, and locations connected) between EBnet and the SMC.

1.4 Time Frame

This Interface Control Document (ICD) shall be in effect from the date of the last approval signature.

1.5 Goals and Objectives

The goals of EBnet are to:

a. Implement an operational, integrated, transparent communications system that serves the data communications needs of projects supported by NASA Goddard Space Flight Center (GSFC), and users outside the MO&DSD.

b. Expand using industry standard system solutions while maintaining compatibility with the existing network and user interfaces.

c. Minimize costs for implementation, operation, and maintenance of the network.

d. Minimize life-cycle costs.

e. Maintain high availability by designing with redundancy, and without single points of failure in the Network Backbone.

f. Utilize state-of-the-art technology, utilizing equipment with the best price-performance available commercially.

g. Allow for growth, adaptability to changing requirements, infusion of new technology, and upgraded interfaces throughout the life-cycle.

h. Provide for reliable data transfer between host systems and users.

1.6 Standards Precedence

EBnet will be based on Government, commercial, and international standards. In case of conflict, the following precedence (in descending order) applies:

- This EBnet ICD
- Government standards
- Commercial and/or international standards

1.7 Document Organization

Section 2 contains parent, applicable, and reference documents related to this ICD.

Section 3 details a systems overview of the EBnet, SMC and the interrelationship.

Section 4 presents an interface detailed design.

Section 5 describes the facilities agreements.

Appendix A is used to document the EBnet schema.

Appendix B contains the EBnet electronic mail template.

Appendix C contains the table of unique site identifiers.

Appendix D contains a sample EBnet utilization report.

A list of abbreviations and acronyms is provided at the end of the document.

Section 2. Related Documentation

2.1 Parent Documents

[1] *Earth Observing System Detailed Mission Requirements*, Interim Draft Release, July 1995

[2] *Earth Science Data Information System (ESDIS) Project Level 2 Requirements Volume 6, EOSDIS Backbone Network (EBnet) Requirements*, Goddard Space Flight Center (GSFC) 505-10-01-6, December 1995

[3] *Earth Observing System (EOS) Data and Information System (EOSDIS) Backbone Network (EBnet) Interface Requirements Document (IRD)*, Draft, August 1995

[4] *Communications Requirements for ECS Project*, 220-CD-001-004, GSFC, October 1995

2.2 Applicable Documents

[5] *Electrical Characteristics of Balanced Voltage Digital Interface Circuits*, Electronic Industries Association (EIA) 422-A, December 1978

[6] *General-Purpose 37-Position and 9-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange*, EIA 449, November 1977

[7] *Internet Protocol (IP): DARPA Internet Program Protocol Specification*, Request for Comment (RFC) 791, September 1981

[8] *The Point-to-Point Protocol (PPP)*, RFC 1661, July 1995

[9] *An Ethernet Address Resolution Protocol or Converting Network Protocol Addresses to 48-bit Ethernet Addresses for Transmission on Ethernet Hardware*, RFC 826, November 1982

[10] *Internet Control Message Protocol*, RFC 792, September 1981

[11] *Routing Information Protocol (RIP)*, RFC 1058

[12] *Open Shortest Path First (OSPF)*, RFC 1247

[13] *Internet Group Multicast Protocol (IGMP)*, RFC 1112

[14] *On the Assignment of Subnet Numbers*, RFC 1219

[15] *Simple Network Management Protocol (SNMP)*, RFC 1157

[16] *Address Resolution Protocol (ARP)*, RFC 826

[17] *A Reverse Address Resolution Protocol (RARP)*, RFC 903

[18] *Internet Protocol on Ethernet Networks*, RFC 894

[19] *Transmission of IP over FDDI*, RFC 1188

[20] *Structure of Management Information*, RFC 1155

[21] *Management Information Base - II*, RFC 1213

[22] *Transmission Control Protocol*, RFC 793

[23] *Telnet Protocol*, RFCs 854 & 855

[24] *File Transfer Protocol*, RFC 959

[25] International Organization for Standardization (ISO) 9314-1, *FDDI Physical Layer Protocol (PHY)*

[26] ISO 9314-2, *FDDI Media Access Control (MAC) Protocol*

[27] ISO 9314-3, *FDDI Physical Layer Medium Dependent (PMD)*

[28] ISO 8802-2, *Logical Link Control (LLC)*

[29] ISO 8802-3, *Carrier-Sense Multiple-Access with Collision Detection (CSMA/CD) Media Access Control (MAC) - Ethernet version 2*

[30] Institute of Electrical and Electronic Engineers (IEEE) 802.3 *10Base-T (twisted pair)*

[31] IEEE *10Base5 (thick ethernet)*

[32] International Telegraph and Telephone Consultative Committee (CCITT) *V.35*

[33] *Hypertext Markup Language (HTML), Version 2.0*, RFC 1866

[34] *Hypertext Transfer Protocol (HTTP), Version 1.0*, RFC 1945

[35] *FDDI Station Management (SMT), Draft 7.2*, American National Standards Institute (ANSI) X3.229, June 1992

2.3 Reference Documents

[36] *NASA Communications (Nascom) Access Protection Policy and Guidelines*, 541-107, Revision 2, GSFC, August 1995

[37] *NASA Communications System Acquisition and Management*, NASA Management Instruction (NMI) 2520.1D, National Aeronautics and Space Administration (NASA), November 18, 1991

[38] *Nascom IONET Users Guide*, 541-225, Revision 1, March 1996

[39] *Earth Observing System (EOS) Data and Information System (EOSDIS) Backbone Network (EBnet) Operations Concept Document*, Revision 1, 540-028, May 1996

[40] *Earth Observing System (EOS) Data and Information System (EOSDIS) Backbone Network (EBnet) Security Plan*, 540-103, May 1996

[41] *Earth Observing System (EOS) Data and Information System (EOSDIS) Backbone Network (EBnet) Security Policy and Guidelines*, 505-10-23, March 1996

Section 3. Systems Overview

3.1 EBnet General System Description

The EBnet provides wide-area communications circuits and facilities between and among various EOS Ground System (EGS) elements to support mission operations and to transport mission data between EOSDIS elements. The relationship of EBnet to other elements supporting EOS is shown in Figure 3-1. EBnet is responsible for transporting spacecraft command, control, and science data nationwide on a continuous basis, 24 hours a day, 7 days a week. The EBnet capability to transport these diverse types of data is implemented as two distinct subnetworks referred to as "real-time" and "science" networks. The real-time network transports mission-critical data related to the health and safety of on-orbit space systems and raw science telemetry as well as pre-launch testing and launch support. This highly redundant network provides an operational availability of 0.9998 with a Mean Time to Restore Service (MTTRS) of 1 minute. The science network transports data collected from spacecraft instruments and various levels of processed science data including expedited data sets, production data sets, and rate-buffered science data. The science network provides an operational availability of 0.98 with a MTTRS of 4 hours.

EBnet provides three options for accessing the Internet Protocol (IP)-based EBnet transport service: local area network (LAN) Ethernet, LAN Fiber Distributed Data Interface (FDDI), and wide area network (WAN) carrier service. Figure 3-2 shows an example of each of these types of interface/demarcation points to EBnet users. This ICD describes the EBnet/SMC interface which uses the WAN and/or LAN interface types.

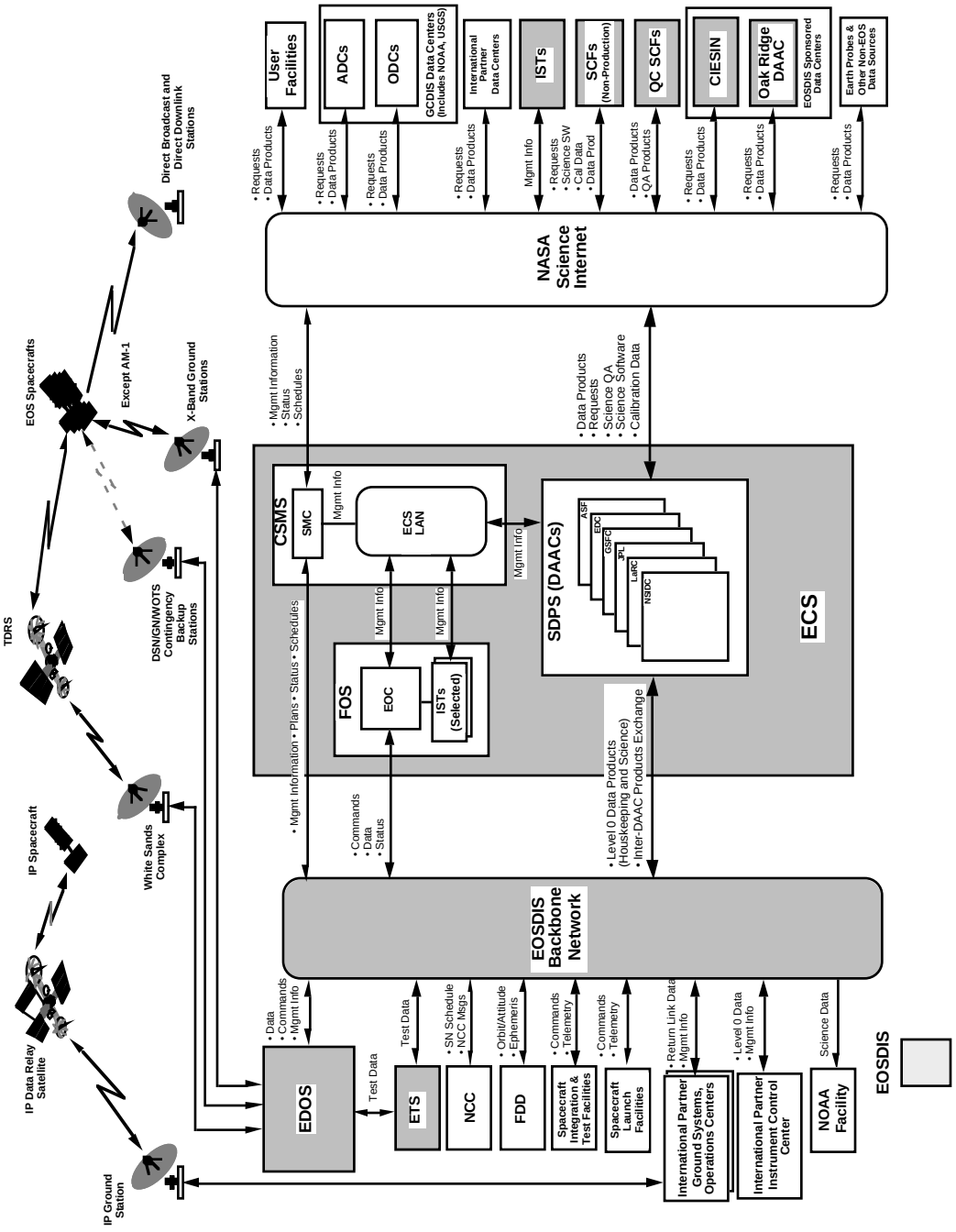

Figure 3-1. EOS Ground System

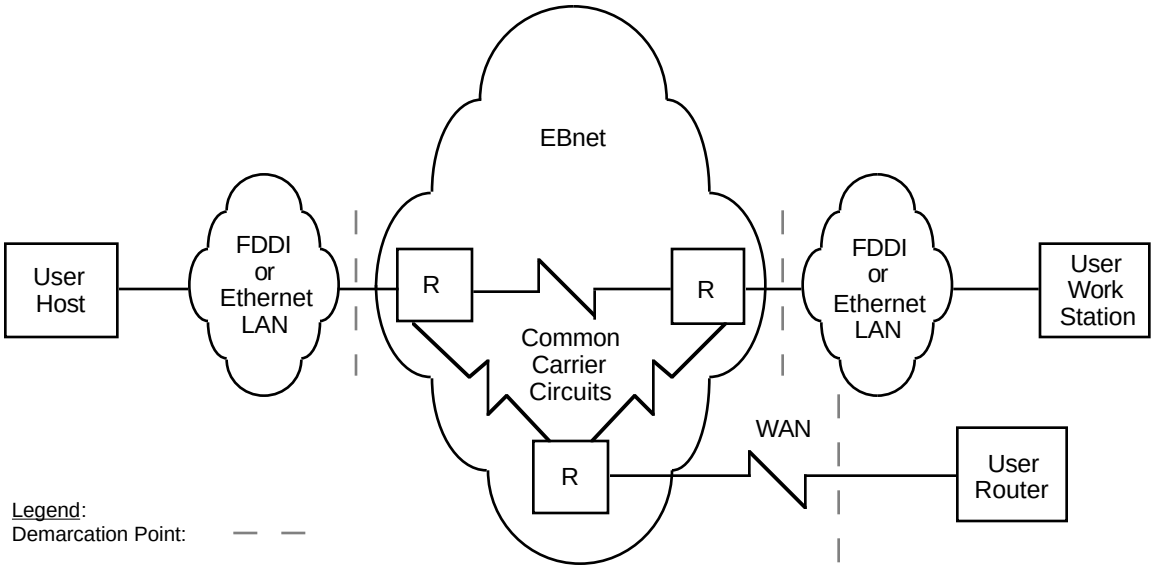

Figure 3-2. EBnet Demarcations

Sustaining engineering, preventive and remedial maintenance, and network monitoring services are provided for EBnet equipment, to ensure that EBnet keeps pace with technology and standards, and provides continuous service. The official point of contact for EBnet operational status is the Nascom Communications Manager (301-286-6141). Users who detect a network problem are urged to immediately report it to the COMMGR. The COMMGR may also provide users with limited information about maintenance and status actions. Refer to the Nascom IONET User Guide (541-225) for information regarding user connections, security guidelines, and maintenance information.

3.2 SMC Description

The SMC is a part of NASA's EOSDIS Core System (ECS). EOSDIS, when fully deployed, will consist of Distributed Active Archive Centers (DAACs), an EOSDIS Operations Center (EOC), and the SMC.

Systems management functions are provided locally at each EOSDIS site and on a system-wide basis at the SMC. The system management functions provided include:

- Fault Management
- Performance Management
- Accountability Management
- Security Management
- Logistics/Configuration Management
- Ground Event Scheduling

- Trouble Ticketing
- Directory Services
- Inventory Services

The SMC serves to maintain ECS standards and policies, perform trending analysis across multiple EOSDIS sites, provide problem-resolution support and coordination, support unattended DAAC operations, and provide specific high-level services (e.g., user billing) that cannot be economically done at each individual EOSDIS site.

The SMC would perform detailed analysis at the site level only for selected events that might have causes or implications across multiple EOSDIS sites. An example of this kind of activity would be a systematic intrusion attempt across multiple EOSDIS sites.

The SMC, located in Building 32 at GSFC, consists of the network architecture shown in Figure 3-3. As shown, the SMC consists of workstations, servers, printers, and network equipment. The SMC connects to the GSFC DAAC router as a gateway for external communications through EBnet. A FDDI dual-attached ring is used to connect the EBnet FDDI switch to the GSFC DAAC router.

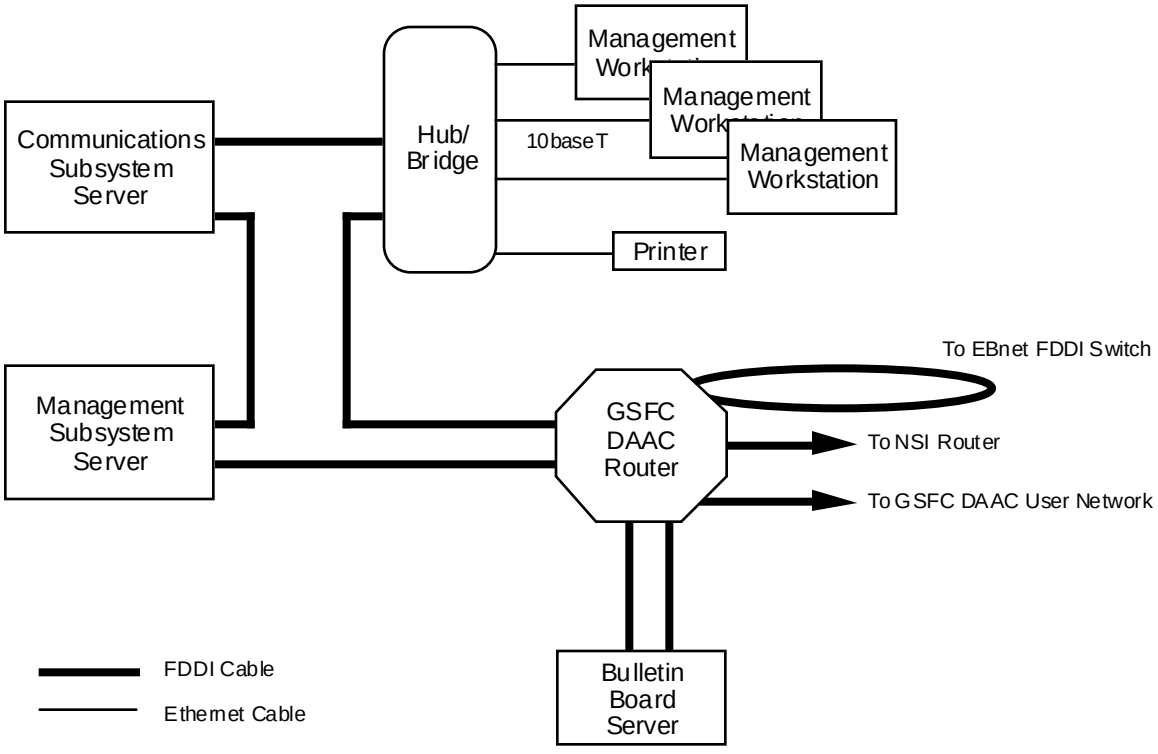

Figure 3-3. SMC Network Architecture

3.3 Relationship Between EBnet and SMC

The purpose of the interface between the SMC and EBnet is to support connectivity between the SMC and all ECS DAACs and between the SMC and the EBnet network management subsystem (NMS). All data flows into or out of the SMC supported by EBnet are considered to be non-mission critical traffic with a MTTRS of 4 hours. The interface between the SMC and the NMS is used for the exchange of management data supporting inter-system coordination.

Section 4. Interface Detailed Design

4.1 Interface Design Overview

The EBnet/SMC interface provides the network connection to all EBnet-supported systems as well as the exchange of enterprise management information with the EBnet Network Operations Center (NOC) in Building 14. The SMC interface supported by EBnet consists of a single dual-attached FDDI interface into the EBnet FDDI switch located in Building 32 at GSFC as shown in Figure 4-1. This single 100-megabits per second (Mbps) FDDI interface provides the connectivity to all EBnet facilities. Figure 4-2 shows the detailed connectivity of all the different EBnet-supported systems at GSFC as well as the WAN connections to other EBnet locations.

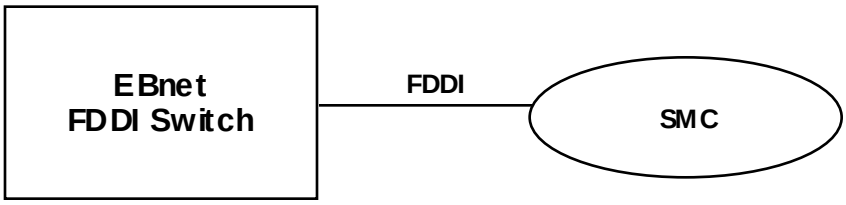

Figure 4-1. SMC Interfaces

4.2 Design Assumptions

SMC does not transfer any real-time information.

EBnet will distribute EBnet trouble tickets and subsequent updates to affected elements of EOSDIS, specifically local system managers (LSMs), EDOS, EOC and NSI. All trouble tickets and updates will also be sent to SMC.

EBnet will accept trouble tickets from SMC and the EOSDIS elements noted previously.

The exchange medium for trouble tickets is fixed-format electronic mail messages transmitted via Simple Mail Transfer Protocol (SMTP).

EBnet will provide all enterprise management information to a web server contained on a workstation in the Building 14 EBnet NOC. The EBnet web server may be queried at any time to obtain up-to-date information concerning service-affecting trouble tickets, reports and EBnet topologies.

Each LSM will also be linked to EBnet via user-programmable Nascom voice loop capability for backup coordination and resolution of critical multi-domain problems.

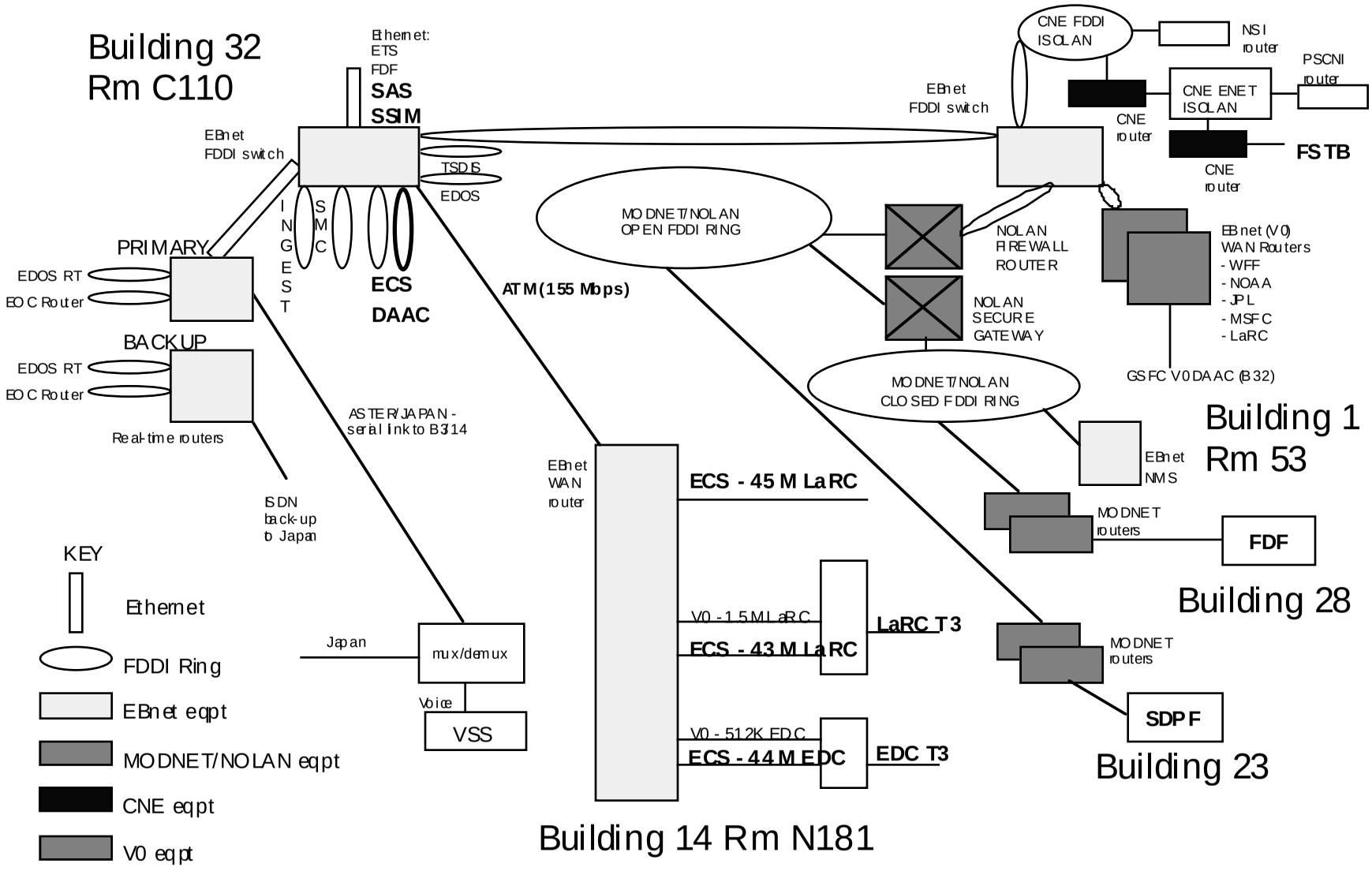
Building 32
Rm C110
Ethernet:
ETS
FDF
SAS
SSIM
EBnet
FDDI switch
TSDIS
EDOS
INGEST
SMC
ECS
DAAC
PRIMARY
EDOS RT
EOC Router
BACKUP
EDOS RT
EOC Router
Real-time routers
ISDN
back-up
to Japan
ASTER/JAPAN -
serial link to B314
ATM (155 Mbps)
MODNET/NOLAN
OPEN FDDI RING
CNE FDDI
ISOLAN
NSI
router
PSCNI
router
EBnet
FDDI switch
CNE ENET
ISOLAN
CNE
router
FSTB
CNE
router
NOLAN
FIREWALL
ROUTER
NOLAN
SECURE
GATEWAY
EBnet (V0)
WAN Routers
- WFF
- NOAA
- JPL
- MSFC
- LaRC
GSFC V0 DAAC (B32)
MODNET/NOLAN
CLOSED FDDI RING
Building 1
Rm 53
EBnet
NMS
MODNET
routers
FDF
Building 28
MODNET
routers
SDPF
Building 23
EBnet
WAN
router
ECS - 45 M LaRC
V0 - 1.5 M LaRC
LaRC T3
ECS - 43 M LaRC
V0 - 512K EDC
EDC T3
ECS - 44 M EDC
Building 14 Rm N181
Japan
mux/demux
Voice
VSS
KEY
Ethernet
FDDI Ring
EBnet eqpt
MODNET/NOLAN eqpt
CNE eqpt
V0 eqpt

Figure 4-2. GSFC Site Design for AM1 Support (Release B)

Any automated information systems security incidents will be processed according to EBnet, Nascom, EOSDIS and NASA security policy as detailed in the "EBnet Security Plan", the "EOSDIS Security Policy and Guidelines" and other applicable documents referenced within those documents.

4.3 Overview of System Interfaces

The following sections detail the standards that will be supported at each level of the International Organization for Standardization (ISO) seven-layer model.

4.3.1 ISO Layer One Interface Control (Physical Layer)

EBnet will support the following physical layer connections:

a. Institute of Electrical and Electronic Engineers (IEEE) 802.3, 10BaseT (unshielded twisted pair) with RJ45 connectors

b. IEEE 10Base5 (thick ethernet, RG-8 coax, 50 ohm impedance) with 15-pin connector

c. ISO 9314-1, FDDI Physical Layer Protocol (PHY)

d. ISO 9314-3, FDDI Physical Layer Medium Dependent (PMD)

e. International Telegraph and Telephone Consultative Committee (CCITT) V.35 for speeds above 19.2 kilobits per second (Kbps)

f. Electronic Industries Association (EIA) RS-422 for speeds above 19.2 Kbps

4.3.2 ISO Layer Two Interface Control (Data Link Layer)

EBnet will support the following data link layer protocols:

a. ISO 802.2, Logical Link Control (LLC)

b. ISO 8802-3, Carrier-Sense Multiple-Access with Collision Detection (CSMA/CD) Media Access Control (MAC) - Ethernet Version 2.0 is supported

c. ISO 9314-2, FDDI Media Access Control (MAC) Protocol

4.3.3 ISO Layer Three Interface Control (Network Layer)

EBnet will support the following network layer protocols:

a. Request for Comment (RFC) 791, Internet Protocol Version 4.0

b. RFC 826, Address Resolution Protocol (ARP)

c. RFC 903, A Reverse Address Resolution Protocol (RARP)

d. RFC 1058, Routing Information Protocol (RIP)

e. RFC 1247, Open Shortest Path First (OSPF)

4.3.4 Upper-Layer Protocols

EBnet will support transparent communications for upper-layer protocols.

4.3.5 Web Server Standards

EBnet will support the following web server specifications:

a. RFC 1866, HTML version 2.0

b. Hypertext Transfer Protocol (HTTP) version 1.0

4.3.6 Network/Station Management

EBnet shall support, at a minimum, the following management protocol:

a. FDDI Station Management (SMT) 6.2 or higher

4.4 Routing and Addressing Guidelines

EBnet will be internetworked by routers and switches which will be configured to support only the IP, and will provide isolation for separate networks. Cisco 7500 routers and Bay Networks BCN routers have been chosen to provide network access to users.

EBnet will utilize standard IP addressing conventions. EBnet will provide a Class C subnet address if requested by the user.

4.5 Data Flow Requirements

The purpose of the interface between EBnet and the SMC and other EOSDIS elements is to support connectivity to the various EBnet-supported internal and external systems. All EBnet-supported SMC data flows are non-mission critical traffic with a MTTRS of 4 hours as shown in Table 4-1.

The data flows between the SMC and the EBnet NMS require additional characterization in order to exchange management data supporting inter system coordination. This management data consists of EBnet-to-SMC trouble tickets, SMC-to-EBnet trouble tickets, EBnet network management reports, and a EBnet topology map. The following paragraphs describe this information.

Table 4-1. EBnet-to-SMC Data Flow Requirements

Source	Destination	Data Type	Data Transfer Format	Volume
EBnet NOC	SMC and affected EOSDIS elements including LSMs, EOC, EDOS and NSI	Trouble Tickets	Fixed-format email and simultaneously posted on Web server in HTML	low
EBnet NOC	SMC	Reports	Web server, text files	low
EBnet NOC	SMC	EBnet Topology	Web server, postscript file	low
SMC	EBnet NOC	Web server access	Web server queries, HTTP	low
SMC LSMs, EOC, EDOS, NSI	EBnet NOC	Trouble Tickets	Fixed-format email	low
SMC	All DAACs	Management info	IP Transparent	low
All DAACs	SMC	Management info	IP Transparent	low
SMC	TSDIS	Management info	IP Transparent	low
TSDIS	SMC	Management info	IP Transparent	low
SMC	EOC	Management info	IP Transparent	low
EOC	SMC	Management info	IP Transparent	low

4.5.1 EBnet-to-SMC Trouble Tickets

The Remedy Action Request System is being used by EBnet, SMC and other EOSDIS elements as a common tool for managing trouble administration. This common trouble ticketing capability will provide the basic interface for interchange of trouble tickets and a mechanism for coordination of problem resolution among the independent elements.

A common Remedy schema has been developed jointly by EBnet, SMC and NSI and will be used as the format for exchange of trouble tickets and the subsequent status updates. The contents of this common schema are documented in Appendix A. A Remedy system will send a trouble ticket by extracting the schema data into a fixed-format text electronic mail message and transmitting the message to specified recipients via SMTP. (The format of the email message is specified in Appendix B.) The receiving system will automatically ingest the fixed-format email message into its Remedy software. EOSDIS elements not utilizing Remedy will simply process the trouble ticket as an email message.

EBnet will send trouble tickets directly to the affected EOSDIS elements, as well as sending a copy to the SMC. EBnet trouble tickets and subsequent updates will also be posted on the EBnet NOC World Wide Web (WWW) server. All EBnet trouble ticket numbers will be prefixed by EBnet's unique domain prefix, EBN, so that their origin will be easily identifiable. Appendix C contains a list of unique domain prefixes.

EBnet operators will generate trouble tickets for service-affecting events such as circuit outages, router outage, interface down and other conditions as documented in the EBnet operations guide.

4.5.2 SMC-to-EBnet Trouble Tickets

EBnet will accept trouble tickets using the common schema (documented in Appendix A) directly from EOSDIS elements experiencing network service degradation or failures believed to be associated with EBnet. EBnet operators will work with the affected site to validate and resolve the problem.

To minimize the frequency of trouble tickets exchanged between EOSDIS elements, pairwise inter-domain events that will cause the generation of a trouble ticket will be identified and agreed upon by the associated domains. Trouble ticket numbers on all trouble tickets sent to EBnet should be prefixed by the sending element's unique domain prefix. The originating element should not issue updates to trouble tickets sent to EBnet. Once the EBnet operator confirms that an incoming trouble ticket does identify an EBnet problem, the ticket will be ingested into the EBnet Remedy system as an EBnet trouble ticket with an EBnet unique number and the originating element's ticket is no longer used by the EBnet operator.

4.5.3 EBnet Reports

The EBnet report will be posted on the EBnet web server at 8-hour intervals. This report will consist of Bytes In, Bytes Out, Utilization In, and Utilization Out on a per-interface basis, i.e., for every EBnet interface. Appendix D contains a sample report.

4.5.4 EBnet Topology Map

EBnet will post a gif file containing the EBnet topology map on the web server. When changes are made to the EBnet topology the file will be updated.

4.6 Recommended Equipment List

There will be no EBnet equipment located in SMC-controlled areas.

Section 5. Facilities and Maintenance Demarcation

5.1 Equipment Location

The EBnet Bay Networks BCN router is located at GSFC in Building 32 Room C210-C. A FDDI cable is installed from the SMC DAAC router located at GSFC in Building 32 Room C210-H to the EBnet Bay Networks BCN router.

5.2 Maintenance Demarcation

The demarcation point between EBnet maintenance and SMC maintenance is the connection at the EBnet Bay Networks BCN router. Cabling to the Bay Networks BCN router will be provided by the SMC user.

Appendix A. Transfer Data Dictionary

NOTE

All data items identified in this appendix are entered into the system using a graphical user interface, and are specified using data types that are defined internally (in size, format, and content) within the Remedy Action Request System.

Field: Status
Defined: Current status of trouble ticket in its source system. Reason for rejection can be found in the StatusLog.
Values: Open, Closed, Tracking, Information, Rejected
Data Type: selection
Required: Yes
Field ID: 536870912

Field: EventDescription
Defined: Short description of event which is used to present selection lists through the User UI.
Data Type: character
Size: 255
Required: Yes
Field ID: 536870913

Field: SourceTicketId
Defined: Trouble ticket id from ticket's source system.
Data Type: character
Size: 15
Required: Yes
Field ID: 536870914

Field: ContactInformation
Defined: Name, phone, fax, etc. of responsible person(s) at source site.
Data Type: character
Size: 255
Required: Yes
Field ID: 536870915

Field: SourceCreateDate
Defined: Timestamp when ticket was created in source system. GMT.
Data Type: timestamp
Required: Yes
Field ID: 536870916

Field: AffectedSites
Defined: Space separated list of site ids for sites affected by event.
Values: See table below for current list of supported sites.
Data Type: character
Size: 255
Required: Yes
Field ID: 536870917

Field: Activity
Defined: If an outage is determined to be from a planned outage the ticket will be marked as such, otherwise it will be marked unplanned. This field is *NOT* used for scheduling future planned outages.
Data Type: character
Size: 25
Required: Yes
Field ID: 536870918

Field: StatusLog
Defined: All diagnostic notes and any other information deemed important to the destination site. All related external trouble tickets received against this problem will be included here and marked "\nEOSXID: SourceTicketNumber\n". The reason for rejecting a messages is included here as well.
Data Type: Diary
Required: Yes
Field ID: 536870919

Field: SourceClosedDate
Defined: Timestamp of when source system closed their ticket. GMT.
Data Type: timestamp
Required: Yes
Field ID: 536870920

Field: SourceSiteId
Defined: Site id of site that sent you this ticket.
Values: See table below for current list of supported sites.
Data Type: character
Size: 30
Required: Yes
Field ID: 536870921

Field: DestinationSiteId
Defined: Site id of site that you intend to receive this ticket.
Values: See table below for current list of supported sites.
Data Type: character
Size: 30
Required: Yes
Field ID: 536870922

Implementor’s Notes for Common Schema

Field: Status

This field may have only one value. The value will be updated as problem is worked. The acceptable values are enumerated in the schema. On any status change, an update of the ticket is sent to relevant organizations (as listed in the AffectedSites field). If ticket is rejected, a rejection notice is sent to the originating organization.

Field: EventDescription

This is a free format field. The intention is to use it to contain a condensed summary of the event. Used by Remedy when displaying a selected list of tickets to provide the user summary information on ticket content.

Field: SourceTicketID

This is the ticket number from the originator's system. This field may contain only one value, which may be up to 15 characters in size and must use the unique site identifier prefix as the first three characters of the ticket number. E.g., an EBnet ticket SourceTicketID field could contain EBN######.

Field: ContactInformation

This is a free format field. The intended use is to identify the person having the problem or someone who can discuss the problem at the remote end.

Field: SourceCreateDate

This field is in Remedy timestamp format using GMT.

Field: AffectedSites

The maximum size of this field is 255 characters. This field must contain only the unique site identifiers. The field may contain multiple site identifiers separated by spaces. The identifiers selected should represent the sites affected by the service problem and will be matched with the appropriate email address for that site by Remedy and used to route the trouble ticket to the affected sites. Values can be added to this field at any time via the picklist.

Field: Activity

Acceptable values are "planned" and "unplanned". This field is not used for scheduling preventative maintenance, but will be used after a service problem is identified to describe if the remote site was offline by their own choice.

Field: StatusLog

This field is intended to contain the entire record of troubleshooting and problem symptoms, entered in free format. Additionally, a history of relevant remote troubletickets will be maintained within this free format log labelled "\nEOSXID: SourceTicketNumber\n" so that they can be easily identified using pattern recognition software. All duplicate tickets received for the same problem will be rejected, but entered into statuslog with EOSXID, and they become an affected site and get added to the "AffectedSite" field. This field is of unlimited size.

Field: SourceClosedDate

This field is in Remedy time format using GMT and may contain only a single value.

Field: SourceSiteID

This field should contain the unique site identifier of the site originating the ticket. It may contain only one value. This field was included so that there will be no confusion about senders and recipients.

Field: DestinationSiteID

This field should contain the unique site identifier of the site receiving the ticket. It may contain only one value. This field was included so that there will be no confusion about senders and recipients.

Appendix B. Electronic Mail Template

This is the Remedy email template that will be used to implement the transfer of fault management trouble tickets between EOS, EBnet, and NSI.

```
Schema: Trouble-Ticket-Xfer
Server:
Login:
Password:

             Status !536870912!:
# Values: Open, Closed, Tracking, Information,
#    Rejected
   EventDescription !536870913!:
          StatusLog !536870919!:
           Activity !536870918!:
   SourceCreateDate !536870916!:
   SourceClosedDate !536870920!:
     SourceTicketId !536870914!:
      AffectedSites !536870917!:
       SourceSiteId !536870921!:
 ContactInformation !536870915!:
  DestinationSiteId !536870922!:
```

Appendix C. Table of Unique Site Identifiers

NOTE

This is not intended to be an exhaustive list of EOSDIS sites, but rather reflects the sites participating in the first phase of the Enterprise Management Concept team which have initially agreed upon a trouble ticket exchange mechanism.

EOSDIS Sites	Site IDs
SMC	SMC
EOC	EOC
GSFC	GSF
LaRC	LAR
MSFC	MSF
EDC	EDC
NSIDC	NSC
JPL	JPL
ASF	ASF
ORNL	ORN
ECS EDF	EDF
EDOS	EDO
EBnet	EBN
NSI	NSI
ASTER	AGS

Appendix D. Sample EBnet Utilization Report

This is a sample of the EBnet utilization report contents and format that will be provided at 8-hour intervals on the EBnet web server.

EBNet Utilization Statistics for: 1/25/1996 Time: 0:00 to 08:00

STARTPT	ENDPT	IFIPUM	IFOPUM	IFIOCTSS	IFOOCTSS
GSFC	LaRC	0.4250	4.1664	11753042	115228264
GSFC	MSFC	0.0624	2.1505	10410600	358548847
GSFC	NOAA	3.5899	3.4572	601899616	576439706
GSFC	NOAA	3.5899	3.4572	601899616	576439706
GSFC	JPL	0.6346	1.7421	105807846	290508105
GSFC	WFF	0.4487	0.4287	2717704	2592800
JPL	NSIDC	1.5436	40.2482	85364347	2164862664
JPL	EDC	11.6786	0.5129	1839644218	85543597
JPL	TKSC	0.8538	0.0406	101389776	4824632
JPL	ASF	0.0676	0.0775	1870333	2143891
MSFC	WFF	23.9788	1.1847	1219611458	65491016

Explanation of abbreviations in the table:
STARTPT: One endpoint of the circuit
ENDPT: Other endpoint of the circuit
IFIPUM: Interface Input Utilization (Percentage)
IPOPUM: Interface Output Utilization (Percentage)
IFIOCTSS: Interface Input Octets (Bytes)
IFOOCTSS: Interface Output Octets (Bytes)

Abbreviations and Acronyms

ADC	Affiliated Data Center
ANSI	American National Standards Institute
ARP	Address Resolution Protocol
ASF	Alaska SAR Facility
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
B	building
BCN	Backbone Concentrator Node
CCB	Configuration Control Board
CCITT	International Telegraph and Telephone Consultative Committee
CIESIN	Consortium for International Earth Science Information Network
CNE	Center Network Environment
CSMA/CD	Carrier-Sense Multiple-Access with Collision Detection
CSMS	Communication and System Management Segment
DAAC	Distributed Active Archive Center
DARPA	Defense Advanced Research Projects Agency
DCN	document change notice
demux	demultiplexer
DSN	Deep Space Network
DSNO	Distributed Network Systems Office
EBnet	EOSDIS Backbone Network
ECS	EOSDIS Core System
EDC	EROS Data Center
EDOS	EOS Data and Operations System
EGS	EOS Ground System
EIA	Electronic Industries Association
Email	electronic mail
EOC	EOSDIS Operations Center

EOS	Earth Observing System
EOSDIS	EOS Data and Information System
eqpt	equipment
EROS	Earth Resources Observation System
ESDIS	Earth Science Data and Information System
ETS	EOSDIS Test System
FDD	Flight Dynamics Division
FDDI	Fiber Distributed Data Interface
FDF	Flight Dynamics Facility
FOS	Flight Operations Segment
FSTB	Flight Software Test Bed
GCDIS	Global Change Data & Information System
GN	Ground Network
GSFC	Goddard Space Flight Center
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
ICD	Interface Control Document
IEEE	Institute of Electrical and Electronic Engineers
IGMP	Internet Group Multicast Protocol
info	information
IONET	IP Operational Network
IP	Internet Protocol
IRD	Interface Requirements Document
ISDN	Integrated Services Digital Network
ISO	International Organization for Standardization
ISOLAN	isolated local area network
IST	Instrument Support Terminal
JPL	Jet Propulsion Laboratory
Kbps	kilobits per second

LAN	local area network
LaRC	Langley Research Center
LLC	Logical Link Control
LSM	local system manager
MAC	Media Access Control
Mbps	megabits per second
mgmt	management
MO&DSD	Mission Operations and Data Systems Directorate
MODNET	MO&DSD Operational/Development Network
MSFC	Marshall Space Flight Center
msgs	messages
MTTRS	Mean Time to Restore Service
mux	multiplexer
NASA	National Aeronautics and Space Administration
Nascom	NASA Communications
NCC	Network Control Center
NMI	NASA Management Instruction
NMS	network management subsystem
NOAA	National Oceanic and Atmospheric Administration
NOC	Network Operations Center
NOLAN	Nascom Operational Local Area Network
NSI	NASA Science Internet
NSIDC	National Snow and Ice Data Center
ODC	Other Data Center
OSPF	Open Shortest Path First
PHY	Physical Layer Protocol
PMD	Physical Layer Medium Dependent
PPP	Point-to-Point Protocol
PSCNI	Program Support Communication Network-Internet

QA	Quality Assurance
QC	Quality Control
R	router
RARP	Reverse Address Resolution Protocol
RFC	Request for Comment
RIP	Routing Information Protocol
RT	real time
SAR	Synthetic Aperture Radar
SAS	Spacecraft Analysis System
SCF	Science Computing Facility
SDPF	Science Data Processing Facility
SDPS	Science Data Processing Segment
SMC	Systems Monitoring and Coordination Center
SMT	Station Management
SMTP	Simple Mail Transfer Protocol
SN	Space Network
SNMP	Simple Network Management Protocol
SSIM	Spacecraft Simulator
SW	software
TDRS	Tracking and Data Relay Satellite
TRMM	Tropical Rainfall Measuring Mission
TSDIS	TRMM Science Data and Information System
USGS	United States Geological Survey
VSS	Voice Switching System
WAN	wide area network
WFF	Wallops Flight Facility
WOTS	Wallops Orbital Tracking Station
WWW	World Wide Web

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